only a small per cent. affected. Most of the galls on grafted trees occur at the lower end of the scion at the point of union of the root and scion. Much of the work of the previous two years is being repeated this year, field plots in eight different localities having been planted with 120,000 apple seedlings and root-grafts.

George Grant Hedgcock.

MT. TSUKUBA METEOROLOGICAL OBSERVATORY, FOUNDED BY H. I. H. PRINCE YAMASHINA.

Since the time of Pascal it appears to have been recognized that the exploration of the upper atmosphere is one of the most important for the advancement of cosmical physics. So long as this ocean remains unexplored, modern meteorology will remain at a standstill, since the thermal, electrical, and dynamic conditions of this ocean are in great measure responsible for the meteorological conditions at the earth's surface. Many balloon ascents and kite experiments have, therefore, been undertaken from time to time, and many mountain observatories have been established in Europe and elsewhere by men who determined to capture the secrets of the upper air.

In Japan, too, the importance of the exploration of the upper atmosphere has been recognized ever since the organization of the meteorological service in 1875. Many meteorological expeditions to high mountains have been undertaken by the officials of the Central Meteorological Observatory at Tokio, and by those of the provincial stations, to investigate the phenomena and processes in the high strata of the atmospheric ocean. For instance, to Mt. Fuji (3,720 meters above sea level) during every summer since 1889; to Mt. Gosaishodaké (1,200 meters) in 1888; to Mt. Ontaké (3,060 meters) in 1891; to Mt. Ishizuchi (1,980 meters) in 1894; and to several other mountains whose heights range from 3,000 meters to 740 meters. But all these expeditions have been undertaken only in the warmest season of the year, on account of the impracticability of long residence on the summits in winter time. For the establishment of a first permanent mountain observatory, we owe thanks to the illustrious Prince Yamashina. His Imperial Highness has selected for his observatory Mt. Tsukuba, a remarkable mountain, which stands lonely on a most extensive plain, isolated from all mountain ranges, and which is, moreover, on that part of the Island Empire where cyclones of a very intense character frequently pass by.

Mt. Tsukuba is situated on the eastern coast of Japan, forty miles north-northeast of Tokio. The shape of the mountain is quite conical and its summit splits into two peaks, the western and the eastern. These peaks are one half mile distant from each other, the west peak being the higher of the two. Though only 2,925 feet, or 870 meters, in height, Mount Tsukuba has a commanding view over Musashino, the most extensive plain in Japan. Still grander is the view southwestward from the top of the mountain. The city of Tokio and innumerable towns are dimly visible on the plain. Many miles beyond, the snow-capped summit of Mt. Fuji, the volcanic peak of the Asama, and the holy mountains of Nikko form a magnificent panorama. Toward the south there is nothing visible but the vast Pacific Ocean fading away into infinite space. The whole mountain is covered with pines and cryptomerias, and its summits are dotted with legendary curiosities and shrines, the largest of which latter are sacred to Izanagi and Izanami, the first god and goddess of the mythological Japan. The legend is that Izanagi and Izanami constructed this mountain as a bulwark against the waves of the Pacific, which they had forced to retire to the other side of Kashima, formerly an island in the sea. This tradition is in accordance with the fact, recently verified by Japanese geologists, that the east coast of Japan has been gradually rising during many centuries past. In the midst of this region of poetry and legend our prince-scientist has established his meteorological observatory on the top of the west peak, which, with its two base stations, has been in active operation since the first of January, 1902. The geographical coordinates of the observatory are:

$\phi = 36° 13'$ N.
$\lambda = 140° 06'$ E.
$H = 870$ meters a. s. l.

The main building is constructed of massive wood on a solid stone foundation and is covered with zinc plates for protection from moisture. The building contains an instrument room, a workshop, an office and rooms for the staff. The observatory is perfectly equipped with meteorological and seismological apparatus of the latest designs. A few yards north of the building there stands a high tower of iron construction (11.6 meters in height), on the top of which an anemometer rests. Prince Yamashina's self-registering anemoscope, Robinson's anemometer, Jordan's sunshine recorder and Richards's anemograph for the registration of the vertical component of the wind, are all placed on the upper platform of this tower. To the west of the main building stands a thermometer shelter, in which thermometers, psychrometers with Assmann's ventilation arrangement, a hair-hygrograph and a thermograph of largest model are kept. Under this shelter, ten earth-thermometers are buried at different depths below the earth's surface, with perfect arrangements for the measurement of the surface and underground temperatures.

On the roof of the main building there may be found a lightning rod, wind vane, self-registering and ordinary rain gauges and an anemometer. The instrument room is elegantly equipped with the best meteorological instruments, the more noteworthy of which are Richards's barograph of largest model, self-registering pluviometers, anemometers, mountain barometers, etc. These are placed on stone piers.

It is worthy of special mention that macro- and micro-seismographs have been installed on a granite pier which rests on a gigantic rock. One of the seismographs is the famous horizontal pendulum seismograph devised by Professor F. Omori, the illustrious seismologist of Japan. All seismographs, including Gray's conical pendulum instrument and Ewing's horizontal pendulum seismograph, record ordinary or strong earthquake motion, but fail to give reliable records of the very small or slow motions accompanying earthquakes and of pulsatory oscillations. Professor Omori has adopted the conical pendulum and has constructed a seismograph which can be made to give records not only of earthquakes, both ordinary and strong, but of very small or slow movements of the earth, accompanying earthquakes or due to distant earthquakes, of pulsatory oscillations and of slow changes of level.

In the International Seismological Congress, which was held at Strassburg in 1901, Professor Omori pointed out the importance of seismological observations on mountains and high elevations. No country had as yet undertaken seismological observations on mountains as high as Mt. Tsukuba, until Prince Yamashina equipped his observatory perfectly with seismological instruments. Since this establishment, many seismic phenomena have been observed, the most extraordinary of which were the horizontal movements of the earth's crust in January, 1902. The horizontal motion of microseismic nature which was east-westwise began at 11:09 P.M. on the fourth of January and lasted until the sixth. Again a movement of the same nature began on the twelfth of that month and lasted for a few days. The seismogram given by Omori's instrument shows that these movements began almost at the same hour on each day and ceased in the same way, and that the curves of oscillations are of the same nature. Horizontal movements of such intense character had never been observed before; the most remarkable fact is that nothing was recorded on the lower level.

In connection with this observatory, two base stations were established by Prince Yamashina. The first one is situated at the foot of the mountain, at the height of 36 meters above sea level. The second was built on the east side of the mountain at the height of 240 meters. All the important meteorological elements are here observed three times daily, besides being self-registered.

The personnel of the observatory consists of several observers and computers. As the positions of the director and meteorologists are

not yet filled, the observatory is under the temporary charge of Dr. T. Okada, an assistant meteorologist in the Central Meteorological Observatory of Tokio, and who is one of the ablest and most active among the young scientists of Japan.

The establishment of the Mt. Tsukuba Meteorological Observatory by Prince Yamashina is certainly the initiative of a permanent meteorological survey of the upper atmosphere in Japan, and there can be no doubt but that this generosity of His Imperial Highness will prove eventually to be a great contribution to cosmical physics. As above mentioned, the topography of the mountain is peculiarly favorable to the study of meteorology and its allied sciences. Moreover, the mountain lies on the route taken by many cyclones, so that the observations at this observatory will contribute as much to the study of atmospheric motions, as they will to the physics of the atmosphere in general.

S. Tetsu Tamura.

Washington, D. C.

CURRENT NOTES ON METEOROLOGY.

MONTHLY WEATHER REVIEW.

There is much of general scientific interest in recent numbers of the 1905 volume of the *Monthly Weather Review* of the United States Weather Bureau. This publication is becoming more and more indispensable to students of meteorology, and is now well recognized as one of the important meteorological journals of the world. One feature of the *Review* is the monthly list of 'Recent Papers Bearing on Meteorology.' This bibliography of current literature would be far more useful if some system of listing titles were adopted other than that now used. At present the articles are listed under the names of the different journals and other publications. These names are not given alphabetically, and while the number of the volume is given, the year is not included. Where so much space is allotted to these bibliographical lists, it is much to be regretted that some more systematic, and hence more useful, scheme of listing is not adopted. With the first number of the 1905 volume a new list of recent publications is started, under the heading, 'Recent Additions to the Weather Bureau Library.' These, it is to be noted, are arranged alphabetically, but the year is not in all cases given.

The following papers have appeared in recent numbers of the *Review:*

No. 1, 1905, 'Escape of Gases from the Atmosphere,' by Dr. G. Johnstone Stoney, F.R.S., reprinted from the London, Edinburgh and Dublin *Philosophical Magazine and Journal of Science,* Vol. 7, June, 1904, 6th series, p. 620. A subject of theoretical interest in meteorology, but of great uncertainty.

'Meteorological Charts of the Indian Ocean,' by C. F. Talman. For some years the Meteorological Service of India issued daily synoptic weather maps of the Indian monsoon area, for the region between 36° N. Lat. and 12° S. Lat. It has now been decided to extend the field of observation over the greater part of the South Indian Ocean, and also to include broad areas of the surrounding continents and islands. This new enterprise is an important step towards 'world meteorology,' with successful long-range forecasting as the ultimate end in view.

'Apparatus for Instruction in Physics and Meteorology,' by Professor C. Abbe. A few well-considered suggestions as to the inadvisability of using expensive and complicated instruments in schools. Those who have seen teachers and scholars trying to understand fully the workings of some of the more complex instruments will cordially agree with Professor Abbe.

No. 2, 1905, 'A Relation between Autumnal Rainfall and the Yield of Wheat of the Following Year,' by W. N. Shaw, secretary of the Meteorological Council. Read before the Royal Society, February 2, 1905. The author finds that the dryness of the autumn is the dominant element in the determination of the yield of wheat of the following year in Great Britain. This is one of the few investigations which lead to a fairly definite and direct relation between crop yield and the variation of some meteorological element.

'High Water in the Great Lakes,' by Professor A. J. Henry. The outlook for the present season of navigation is not favorable to a